ONTARIO'S ENVIRONMENTAL TECHNOLOGIES PROGRAM

PARTNERSHIPS FOR A CLEANER ENVIRONMENT

CURRENT PROJECTS

THE ENVIRONMENTAL TECHNOLOGIES PROGRAM

One of the most important tasks in this decade is finding new ways to protect and improve our environment. It's a task that will take time, innovation, money and cooperation. The Environmental Technologies Program (ETP) of the Ontario Ministry of Environment and Energy helps create the partnerships which will achieve the goal of environmental protection.

The ETP assists companies in the development of new technologies to overcome environmentally damaging practices. The program focuses on the latter stages of the technology innovation process, the development, refinement and commercialization of the product or process. Particular emphasis is placed on the creation of technologies which can be marketed internationally and preference is given to technologies that prevent or reduce pollution at the source, rather than at the end of the pipe or stack.

Developmental projects eligible under the ETP fall into six categories:

- Waste Management
- 3Rs Technologies
- Tire Technologies
- Water and Sewage Treatment
- Air Pollution Control
- Analytical Instrumentation

Responsibility for the ETP rests with the the ministry's Research and Technology Section with assistance from the Environmental Technologies Advisory Committee (ETAC).

To be eligible for funding, recipients must operate or reside in Ontario. A wide range of organizations qualify, including Canadian corporations, subsidiaries of foreign owned firms, universities and municipalities.

Typical ventures eligible for funding include:

- research leading to the development of an innovative process or product
- equipment prototype development and testing
- pilot-scale equipment refinement and adaptation
- field trials and demonstration of innovative technologies to determine system performance, reliability and cost effectiveness
- initial demonstration of foreign technologies to determine their suitability to Ontario conditions

Only developmental or demonstration aspects of the technology are eligible for support. Costs associated with full-scale production and marketing are not supported. Generally, funding for a project does not exceed 50 per cent of eligible total costs to a maximum of $500,000 per year for up to three years.

Applications for ETP funding are received throughout the year. The initial step is the submission of a Notice of Intent, a summary of the proposed project which allows the ministry to provide a conceptual response. If the Notice of Intent is received favourably, the applicant is invited to submit a comprehensive proposal. This must include detailed technical and commercial objectives, a budget, anticipated goals, and a commercialization plan. The contribution of the project to ministry technology and regulatory needs must be clearly defined as must the potential value to the environment.

Reviewers from various provincial ministries or agencies, including the Ministry of Economic Development and Trade, give technical and financial evaluations of each proposal. These reviews are based on broad selection criteria including:

- net contribution to environmental protection
- effectiveness in addressing ministry technical, policy and regulatory requirements
- technical excellence
- degree of innovation
- commercialization potential locally and internationally
- industrial and economic benefits
- financial and management capability of the applicant

The ETAC meets regularly to evaluate reviewed proposals using similar criteria. Upon their recommendation for approval, and with senior management concurrence, the ministry negotiates a contract with the proponent. This agreement details milestones or goals to be achieved during the project.

With possible assistance from a technical committee or exernal expert, a ministry Liaison Officer then becomes responsible for monitoring progress toward technical, financial and commercial goals.

The proponent of each project must submit progress reports, including expenditure details, every six months or upon reaching each major milestone. Although payment of some funds is made prior to project initiation, continued payments are generally made only upon achievement of previously negotiated milestones.

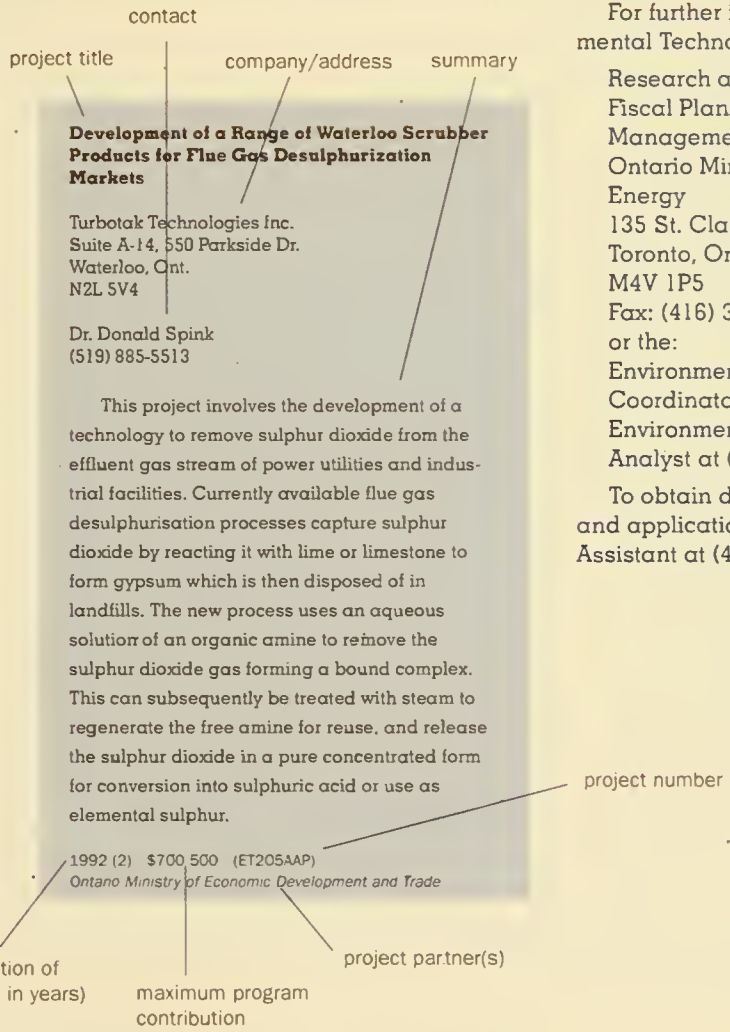
Upon completion of the developmental phase, a report must be submitted which discusses major research and development components, and provides an updated commercialization plan. As well, the net environmental, economic and industrial benefits that will accrue to the province must be defined. Typically, this would include expected reductions in specified emissions, or anticipated levels of reduction, reuse and recycling.

After the commercialization phase, which would typically take three to four years after completion of technical development work, a final report must summarize the production levels and sales achieved, as well as the actual net environmental, economic, employment and industrial benefits achieved. The reasons for any discrepancies between forecast and actual levels or benefits must be discussed.

Participation in the ETP can be a winning situation for everyone - the organizations that develop the new products and processes, all those who ultimately benefit from the new technologies, and, most of all, our environment.

This publication lists active projects in the Environmental Technologies Program as of October 1993 and includes those for which the project technical development phase is completed. Projects are grouped in the six technology development categories of the program. An explanation of a typical entry follows. ➔

Progress reports on many of these projects are available in the Final Program and Proceedings of the 1993 Technology Transfer Conference. To obtain a copy of this document, contact the Program Resources Officer at (416) 323-5879.



For further information on the Environmental Technologies Program, contact the:

Research and Technology Section
Fiscal Planning and Information Management Branch
Ontario Ministry of Environment and Energy
135 St. Clair Ave. W., 11th Floor
Toronto, Ontario
M4V 1P5
Fax: (416) 323-4322
or the:
Environmental Technologies Program Coordinator at (416) 323-4476.
Environmental Technologies Program Analyst at (416) 323-4627.

To obtain detailed program guidelines and application forms, contact the Grants Assistant at (416) 323-4649.

Demonstration of Vitrokele™ Technology to Recycle Cyanides and Metals at Gold Plants

Jasmetech Metal Technologies Inc.
67 Watson Rd. S.
Guelph, Ont.
N1H 6H8

Dr. Denis Kidby
(519) 836-9494

In this project, an economically attractive process based on Vitrokele™ technology for producing environmentally acceptable effluent from gold mills was demonstrated at Bell Creek Mine near Timmins, Ont. Vitrokele™, a family of synthetic adsorbents, capture cyanide as well as significant quantities of such heavy metals as copper from slurries and discharge solutions. The cyanide is recycled back to the primary gold leaching circuit and the metals recovered for other uses. Potentially, this technology could result in a pollution prevention process which recovers all capital expenditure and produces an ongoing operating profit.

1990 (1) $406 000 (ET010WM)

Plasma Gasification Feasibility Study of Hospital Solid Waste PSW89-01

Resorption Canada Ltd.
2610 Del Zotto Ave.
R.R. #5
Gloucester, Ont.
K1G 3N3

Mr. George Carter
(613) 822-1842

An investigation of the plasma gasification disposal of Hospital Solid Waste in their plasma research facility is the focus of this company's developmental work. The process operates at approximately 1200°C and produces an inert slag which may have commercial uses and a medium value heating value gas which may be burned immediately or stored for later use. The plasma disposal system requires an extremely small space compared to other disposal technologies. Optimal operating parameters for the process will be determined and a full environmental analysis for organics, acid gases and trace metals in the product gas, flue gas and quencher water conducted, plus a full leachate analysis of the slag.

1992 (1) $145 400 (ET032WM)
Environment Canada

Development of Innovative Electrochemical Membrane Technology to Permit Source Recovery and Recycling of Waste Acids and Etchants

Prosep Technologies Inc.
Unit 7, 817 Brock Rd. S.
Pickering, Ont.
L1W 3L9

Mr. Michael Sheedy
(905) 831-2474

The objective of this project is the development of an electrochemical membrane process to recover and recycle waste acids, metal salts and etchants from the metal finishing industry. This will help to eliminate the production of hazardous metal hydroxide sludges and salts now produced during the conventional neutralization of such wastes. The project includes laboratory work, construction and operation of a pilot plant and a full-scale demonstration at a secondary steel producer.

1991 (3) $732 600 (ET057WM)

Treatment of Fluids Containing Organic Contaminants

Trojan Technologies Inc.
845 Consortium Ct.
London, Ont.
N6E 2S8

Dr. William Cairns
(519) 685-6660

Under consideration in this project is the development of a process and hardware for the treatment of gases and liquids containing organic contaminants. The process could be used in the treatment of off gases, industrial effluents, groundwater recharge, potable water and wastewater. The process and equipment under development build upon Trojan Technologies' experience in UV reactor design for control of microbial contaminants in water and wastewater. The new process and hardware are being engineered to provide high level destruction of chemical contaminants present in the fluids.

1991 (3) $314 450 (ET076WM)

Development of a Micro-computer Based Expert System for Mine/Mill Effluent Treatment Plant Design (Gold Industry Case)

Wastewater Technology Centre
867 Lakeshore Rd.
P.O. Box 5050
Burlington, Ont.
L7R 4A6

Mr. Abbas Zaidi
(905) 336-4618

A micro-computer based system which can be used to design and tailor the most cost effective effluent treatment system for cyanide/metals/toxicity removal for any given gold mill is being formulated. The expert system, which is being designed specifically for the Ontario gold mining industry with capabilities for expansion into other industrial sectors and the rest of Canada, will be able to generate a comprehensive report containing all relevant information on process design and cost of the selected system.

1991 (3) $284 750 (ET127WM)
Environment Canada

Extension and Finalization of the LANDIS Expert System

Grace Dearborn Inc.
3451 Erindale Station Rd.
P.O. Box 3060, Station A
Mississauga, Ont.
L5T 3T5

Mr. David Young
(905) 279-2222

This study involves the extension and final development of the LANDIS (LANd DISposal) expert system based software decision tool to a form relevant to Canadian situations and suitable for distribution. LANDIS is a solid waste landfill disposal assessment system. It is designed to guide the user through a solid waste assessment process to determine the suitability of disposing a specific waste in a specific landfill site. Expert system rules control the evaluation process and incorporate the expertise necessary to render final conclusions and recommendations. LANDIS is also a useful tool for conducting "what if" hypothetical scenarios.

1991 (3) $200 000 (ET130WM)
Environment Canada

Field-Based Pilot-Scale Remediation Trials for Industrially-Contaminated Environmentally-Hazardous Soils

Tallon Metal Technologies Inc.
67 Watson Rd. S.
Guelph, Ont.
N1H 6H8

Dr. Bruce Holbein
(519) 766-9160

The focus of this project is the design, construction and operation of a field-based pilot scale plant to evaluate a metal extraction and recovery process based on synthetic Vitrokele™ adsorbents for the remediation of contaminated soil. These adsorbents are used in conjunction with standard mineral processing unit processes (soil washing) and proprietary hydrometallurgical processes to produce decontaminated soil for reuse, while recovering metals for use in other applications.

1991 (1) $914 650 (ET173WM)
Environment Canada

Biofiltration of Toxic Metals from Acid Mine Drainage Through Actinorhizal Plant Systems

Mikro-Tek Laboratories
36 Emerald St.
P.O. Box 2120
Timmins, Ont.
P4N 7X8

Mr. Mark Kean
(705) 264-2048

The effectiveness of alders (*Alnus rugosa*) inoculated with the microsymbionts *Frankia* and mycorrhizal fungi as a biological filter for the control of acid mine drainage is being evaluated in this undertaking. The metal and water tolerant alder is proposed as an ideal species for the immobilization of toxic metal pollutants from contaminated soil. Following laboratory/greenhouse studies on metal uptake and tolerance, pilot test plots have been established at a selected site. This ecological approach could prove to be a novel strategy to revegetate sterile areas of former mine tailing ponds.

1991 (3) $225 550 (ET175WM)

Field and Laboratory Evidence of *In Situ* Biotransformation of Tetrachlorethene to Ethene and Ethane at a Chemical Transfer Facility in North Toronto

Beak Consultants Ltd.
42 Arrow Rd.
Guelph, Ont.
N1K 1S6

Dr. David Major
(519) 763-2325

The objective of this project is to demonstrate, in an aquifer of low permeability, *in situ* anaerobic biodegradation or biotransformation of chlorinated alkenes to innocuous, non-toxic products. The study will involve both laboratory and field experiments at a chemical transfer facility to determine what physical and biological parameters, and their interactions, lead to the development of a microbial population capable of degrading tetrachloroethylene. The approach could provide a highly effective, *in situ*, low-cost solution to decontamination of industrial soils.

1992 (1) $10 000 (ET211WM)
Environment Canada

In Situ/On Site Microbiological Clean-Up of Soils Contaminated with Toxic Wood Preservatives

Grace Dearborn Inc.
3451 Erindale Station Rd.
P.O. Box 3060, Station A
Mississauga, Ont.
L5A 3T5

Mr. Igor Marvan
(905) 279-2222

This project details the pilot scale demonstration of a cost-effective technology for *in situ* and on-site bioremediation of wood-treatment soils containing chlorinated phenols and polyaromatic hydrocarbons (PAHs). The technology utilized is based on the addition of solid-phase organic soil amendments of specific particle-size distribution, nutrient profile and nutrient release kinetics to the soil. The amendments increase the accessbility of biologically available water and nutrients to target compound degrading microorganisms, and, in addition, reduce the soil toxicity. This encourages the survival of the microorganisms in soils containing very high concentrations of toxicant organics. Performance data indicate that the technology can be used to reduce high concentrations of chlorinated phenols and PAHs to below remediation criteria for industrial soils.

1993 (1) $373 325 (ET212WM)
Environment Canada

Demonstration of Thermal-Chemical Destruction Process on Highly Contaminated PCB Liquid Wastes

ELI Eco Logic International Inc.
143 Dennis St.
Rockwood, Ont.
N0B 2K0

Mr. Kelvin Campbell
(519) 856-9591

The ECO LOGIC process is a mobile and highly efficient alternative to incineration for the destruction of hazardous wastes, particularly those with substantial water content. The process is based on the gas-phase thermochemical reaction of hydrogen with organic and chlorinated organic compounds. At 850°C or higher, hydrogen combines with organic compounds to form smaller, lighter hydrocarbons, primarily methane. For chlorinated organic compounds such as PCBs, the reduction products include methane and hydrogen chloride. This reaction is enhanced by the presence of water which acts as a reducing agent and hydrogen source. Destruction removal efficiencies of 99.9999% can be achieved using the process. This phase of development involved the processing of dense oil containing approximately 40% PCBs, and contaminated groundwater and soil at a the Middlegrounds Landfill site in Bay City, Michigan.

1992 (1) $250 000 (ET244WM)
Environment Canada
United States Environmental Protection Agency

Self Sealing Self Healing Waste Containment System

Wastewater Technology Centre
867 Lakeshore Rd.
P.O. Box 5068
Burlington, Ont.
L5R 4L7

Ms. Julia Stegemann
(905) 336-4855

The Self-Sealing/Self Healing barrier concept functions on the principle that two reactive salts, mixed separately with two different layers of porous medium, react at the interface to form an insoluble precipitate, thus forming an impermeable layer (self-sealing). The primary advantage of this engineered system is that any disruption of the impermeable layer leads to new contact of the two reactive salts, and renewed formation of the insoluble precipitate (self-healing). The ultimate goal of this work is to produce a marketable generic barrier, adaptable to a wide range of waste site liner and cover applications, and to establish a knowledge base for applying the concept to customized barrier scenarios, using site specific materials.

1993 (3) $198 813 (ET258WM)
Environment Canada

Full-Scale Demonstration of Organic Amendment Technology for Bioremediation of Wood Treatment Soils Contaminated with Chlorinated Phenols and Creosote

Grace Dearborn Inc.
3451 Erindale Station Rd.
P.O. Box 3060, Station A
Mississauga, Ont.
L5C 2S9

Mr. Alan Seech
(905) 279-2222

This project is a full-scale demonstration of the technical and economic feasibility, at a former wood preserving facility, of a process for bioremediation of soil containing chlorinated phenols, polycyclic aromatic hydrocarbons and petroleum hydrocarbons. The technology, already proven successful on a smaller scale, is based upon addition of solid-phase organic soil amendments of specific particle-size distribution and nutrient content to the contaminated site. The amendments increase the ability of the soil matrix to supply biologically available water and nutrients to pollutant degrading microorganisms, and transiently bind pollutants thereby reducing the acute toxicity of the soils aqueous phase, which allows microorganisms to survive in soils containing very high concentrations of toxicants.

1993 (2) $185 250 (ET299WM)
Environment Canada

Engineering Design Study For A Pilot Road Paving Project Using Cold Mix Asphalt and Hydrocarbon Contaminated Soil - Don Roadway Extension South of Commissioners Street, Toronto Portlands Area (Test Strip)

Ashwarren International Inc.
Unit 16, 2283 Argentia Rd.
Mississauga, Ont.
L5N 2X7

Mr. Paul Lum
(905) 819-1290

Cold mix technology incorporating petroleum contaminated soils is a viable cost-effective method of remediating certain petroleum and/or heavy metal contaminated soils, while manufacturing a construction product for use in roadbuilding, paving and landfill liner cap applications This project has involved the pilot-scale design and testing at the Toronto Portlands site of a technology which incorporates petroleum contaminated soil with a proprietary asphalt emulsion to produce a cold mix asphalt product.

1993 (1) $25 000 (ET344WM)

Continued Development and Validation of a Protocol for Solidified Waste Evaluation and Delisting

Wastewater Technology Centre
867 Lakeshore Rd.
P.O. Box 5068
Burlington, Ont.
L7R 4L7

Ms. Julia Stegemann
(905) 336-4738

The factors which affect the ability of a solidified product to retain contaminants are many and complex. Standard regulatory tests are therefore not adequate for assessing the level of environmental hazard associated with a solidified waste, in either the short- or long-term. After nearly a decade of experimentation and consultation, the centre has proposed a series of test methods for evaluating the intrinsic physical and chemical properties of solidified waste which affect its ability to retain contaminants over the long term, in a variety of scenarios. This project will continue the development of the protocol leading to improved test methods, including screening tests for field application, and reasonable performance criteria.

1993 (3) $135 000 (ET368WM)
Environment Canada
British Columbia Ministry of Environment & Parks
United States Environmental Protection Agency

Development of a Process which will Reclaim Scrap and Produce New Products for Interior and Exterior Architectural Applications

Plastiglas Industries Ltd.
403 Clements Rd.
Ajax, Ont.
L1S 6N3

Mr. Stephen Baker
(905) 428-2002

Fibreglass reinforced products cannot presently be recycled. The objective of this project is the development of a new process for the recovery of fibres from fibreglass-reinforced plastic scrap and their incorporation into such new products as interior and exterior building materials, or furniture. When fully operational, the company would be able to recover much of their scrap and that from other fibreglass manufacturers diverting a significant quantity of material from landfill sites.

1991 (1) $67 100 (ET029RS)
National Research Council

Development of Mercury Free Reusable Alkaline Manganese Dioxide (RAM) Consumer Batteries

Battery Technologies Inc.
2480 Dunwin Dr.
Mississauga, Ont.
L5L 1J9

Dr. Josef Daniel-Ivad
(905) 881-5100

The development of mercury-free RAM battery technology for use in small format consumer battery sizes (AAA, AA, C, D) was accelerated in this project. Empahsis was on the further development and refinement of the technology to produce a rechargeable alkaline AA battery free of mercury, and with performance and cost comparable to existing single use alkaline batteries. Developmental work suggests that the new mercury-free RAM cells have the potential of providing the consumer with an environmentally friendly, low cost secondary cell which maintains nearly all characteristics of the primary alkaline system.

1991 (3) $247 500 (ET048RS)

Deinking of Wastepaper by High Pressure Steam Treatment for Paper Reuse

Stake Technology Ltd.
2838 Highway 7
Norval, Ont.
L0P 1K0

Dr. Ernest Yu
(905) 455-1990

The feasibility of continuous steam-explosion treatment in the deinking of selected wastepapers for paper recycling is being assessed in this project. Studies at both the laboratory and pilot scale have suggested numerous technical and economic benefits compared with conventional processes. Using this technology, enhanced ink removal from paper fibres is possible with reduced or even no use of deinking chemicals. This enhanced overall cleanliness of the fibres would also likely reduce the requirement for downstream cleaning after pulping. These benefits have been demonstrated for a wide range of paper types including coated magazines, office waste and old corrugated containers including resin-based wet-strength material.

1991 (2) $192 250 (ET068RS)

Proactive Printer's Waste Ink Recycling, Phase II & III

Proactive Recycling Inc.
235 10th St. W.
Owen Sound, Ont.
N4K 2R3

Mr. Bert Wakeford
(519) 371-6511

This project is centred on the further development and application of a self-sufficient, mobile ink recycling unit, capable of on-site filtering and processing. The compact prototype could be transported to the site of waste generation and produce economically viable daily quantities of recycled ink. It will be able to produce recycled ink with characteristics approaching those of virgin product and ensure full four colour recycling. This could facilitate up to 95% reduction in the amount of hazardous liquid waste ink requiring disposal.

1991 (2) $257 500 (ET080RS)

Development of a Canadian Environmental Protection Technology to Remove and Recycle CFCs and Other Volatile Halogenated Hydrocarbons from Discharge Gas Streams - Phase II

Halozone Recycling Inc.
4000 Nashua Dr.
Mississauga, Ont.
L4V 1P8

Ms. Dusanka Filipovic
(905) 405-8200

Blue Bottle™ Cylinders are portable, non pressurized canisters packed with a synthetic zeolite material. They are used as part of a system to capture CFCs from a variety of residential, automotive, and large scale refrigeration and air conditioning units. In operation, the bottles are connected to the unit and the gases are captured as the refrigerant air stream passes through the cylinder. Once the cylinder is saturated with the CFCs, it is brought to a central reclamation plant where the CFCs are recovered and immediately available for reuse. The cylinder and adsorbent can also be reused. The technology can also be used to capture and reclaim HCFCs and HFCs diluted in air. This phase of development involves field trials of the technology and includes operation of the first Blue Bottle™ reclamation and recycling pilot plant.

1992 (2) $894 066 (ET273RS)
Environment Canada
Industry Canada

Transportable Tire Shredder

Shred-Tech Ltd.
201 Beverly St.
P.O. Box 1508
Cambridge, Ont.
N1R 7G8

Mr. John Bell
(519) 621-3560

This venture has involved the design, development, testing and demonstration of a transportable tire shredder that could be operated at remote locations and smaller landfill sites where permanent installations are not feasible. This would offer an alternative approach to shipping whole tires to central shredding sites. Capabilities of the shredder include single person operation, extended knife life, the ability to handle both car and truck tires, and the ability to ensure 2 to 4" shred size if required.

1992 (1) $300 000 (ET179TT)

Preparing of New Thermo Plastic Compounds Containing Ground Rubber Tires

Queen's University
Department of Chemistry
Kingston, Ont.
K7L 3N6

Dr. Warren Baker
(613) 545-2621

The preparation of thermoplastic compounds containing maximum amounts of ground rubber tires that could be processed into cost effective finished products is the objective of this study. Initially, characteristics of ground rubber from different sources and processes and how their surface and bulk properties can be modified advantageously are being assessed. Accompanying this is an examination of the compounding of ground rubber with several virgin plastic polyethylene polymers. This project will provide scientific information and technical support to Ontario industries pursuing new market and new product opportunities for scrap tires.

1991 (2) $181 058 (ET226TT)

Improvement of Ground Rubber Tire-Asphalt Composition for Road Paving Applications

Queen's University
Department of Chemistry
Kingston, Ont.
K7L 3N6

Dr. Simon Hesp
(613) 545-2615

Rubber tire waste may have an economically and ecologically sound use as an additive to asphalt pavements, an application which could consume a very large number of used rubber tires. This project will investigate the interfacial modification of ground rubber tire-asphalt systems. Various macromolecular stabilizers will be attached to the GRT-asphalt interface in order to prevent particle flocculation and sedimentation problems during storage at processing temperatures. An added benefit of interfacial modification is expected to be a gain in the overall rutting and fracture performance of these asphalt paving materials at service temperatures. In order to assess these property improvements, a comprehensive set of tests will be conducted in close consultation with the Ontario Ministry of Transportation.

1993 (2) $70 000 (ET367TT)

Modular Drinking Water Pilot Plant for the 1990's

University of Waterloo
Department of Civil Engineering
Waterloo, Ont.
N2L 3G1

Dr. Peter Huck
(403) 492-4738

The focus of this development is the design, construction and testing of modular drinking water pilot plants for use in advanced investigations with different water types. State-of-the-art processes such as ozonation, granular activated carbon and biological treatment are included. Ultimately, a refined modular design will be developed to a state of market readiness for Canadian and offshore sales.

1990 (3) $785 900 (ET006WS)

Development of Membrane Technology for Drinking Water Production: Treatment of Coloured Waters

Zenon Environmental Inc.
845 Harrington Ct.
Burlington, Ont.
L7N 3P3

Dr. Pierre Cote
(905) 639-6320

The potential of nanofiltration membrane technology for the removal from water of a number of soluble organic compounds, many of which cause brown-tinted water, is being evaluated. Apart from aesthetic problems, these organic substances react with chlorine during conventional disinfection processes to form such harmful products as trihalomethanes. Membrane technology would be an effective alternative to conventional treatments that are not completely effective, and are either expensive, lead to undesirable by-products or require spacious installations.

1991 (2) $160 000 (ET007WS)

Demonstration of Expert System Software for Pollution Control Planning

Wastewater Technology Centre
867 Lakeshore Rd.
P.O. Box 5050
Burlington, Ont.
L7R 4A6

Ms. Judy Czajkowski
(905) 336-4599

The formulation of an integrated set of computer-based tools which will allow the systematic planning and evaluation of municipal sewage collection and treatment facilities is the objective of this project.

1991 (3) $300 000 (ET017AWS)

Further Development of the Rayox® Enhanced Oxidation Product

Solarchem Enterprises Inc.
Unit 5, 40 West Wilmot St.
Richmond Hill, Ont.
L4B 1H8

Dr. Stephen Cater
(905) 764-9666

Removal of organic pollutants from the aquatic environment using the Rayox® enhanced oxidation technology involves using high-powered ultraviolet lamps, with oxidants, which cause the generation of reactor intermediates such as the hydroxyl radical, leading to mineralization to harmless substances. Treatment of a variety of contaminated waters have been examined, including process wastewater and groundwater. Excellent results have been obtained to date even in the most problematic process waters. Such compounds as chlorinated organics, aromatic hydrocarbons, N-Nitrosodimethylamine and pentachlorophenol can all be readily reduced to or below required discharge levels. Research and development is focusing on physical and chemical process improvements to reduce the overall costs of treating contaminated water.

1990 (2) $688 000 (ET024WS)

Hard Metal, High Efficiency Sludge Handling Pump

Hayward Gordon Ltd.
7505 Bath Rd.
Mississauga, Ont.
L4T 1L3

Mr. John Hayward
(905) 677-6440

This undertaking involves the design, development and field evaluation of eleven models (horizontal, vertical dry pit and immersible configurations) of a hard metal, screw impeller centrifugal pump to be used for handling both sewage and sludge in municipal and industrial wastewater treatment plants. This may lead to development of a superior system for the transfer of heavier and grittier municipal and industrial waste sludges and contribute to the more efficient and economic operation of wastewater treatment plants.

1991 (2) $134 000 (ET036AWS)
Ontario Ministry of Economic Development and Trade

Catalysed Reductive Degradation of Halogenated Organic Compounds

Waterloo Centre for Groundwater Research
University of Waterloo
Waterloo, Ont.
N2L 3G1

Dr. Robert Gillham
(519) 888-4658

Halogenated organic compounds are a major threat to the water environment. A cost-effective method based on reductive dehalogenation with metal surfaces acting as a catalyst for the removal of such halogenated organic compounds from water is being investigated in this project. This could be an alternative to such processes as activated carbon adsorption or aeration. Through laboratory and field testing, a system having application in such areas as remediation of existing zones of groundwater contamination and the removal of trihalomethanes from chlorinated municipal water supplies is being developed and tested.

1991 (2) $227 000 (ET074WS)

Development of Continuous Preparation of Activated Silica

National Silicates Ltd.
429 Kipling Ave.
Toronto, Ont.
M8V 3S7

Mr. Stephen Gibson
(416) 255-7771

Under development in this project is a process for the continuous preparation of activated silica, an effective inorganic coagulant aid. Activated silica is produced through the polymerization of sodium silicate with a variety of activating agents. It has been demonstrated as an effective coagulant aid in the reduction of total phosphorus discharges from sewage treatment plants and other industrial institutions. Successful development of an on-site production process that is practical and economical would enable the manufacture of an alternative to organic polyelectrolytes for use in potable, sewage and industrial wastewater treatment.

1991 (2) $194 000 (ET132WS)

Wastewater Aerator Prototype

Aqua Aeration Systems Inc.
3221 Valmarie Ave.
Mississauga, Ont.
L5C 2A4

Mr. Andrew Jankowski
(905) 338-9237

The fabrication and installation at a sewage plant of a full-scale prototype aerator design consisting of a multi-bladed conical configuration enclosed in a similarly conical encasement is the focus of this venture. The aerator functions by drawing in and mixing atmospheric air from above the liquid. Its efficiency is such that it can function effectively without the need for a supplementary supply of air. When installed in existing wastewater treatment facilities, the aerator would have the capability to simultaneously increase capacity and reduce operating costs through reduced energy and maintenance requirements.

1991 (1) $90 000 (ET135WS)

Technology for Destruction of Organic Pollutants and Detoxification of Inorganic Pollutants in Water Streams

Matrix Photocatalytic Inc.
1st Floor, 511 McCormick Blvd.
London, Ont.
N5W 4C8

Mr. Tony Powell
(519) 457-2963

This project involves the design, construction and testing of a commercially viable TiO_2 photocatalytic technology for the destruction of organic pollutants in water. Such a technology would be superior to such conventional treatment processes as air stripping and activated carbon adsorption because the organic contaminants are destroyed and not merely transferred to another medium such as air or carbon.

1991 (2) $201 040 (ET139AWS)
Environment Canada

Development of Sealable-Joint Sheet Pile Cutoff Walls for Groundwater Remediation

Waterloo Centre for Groundwater Research
University of Waterloo
Waterloo, Ont.
N2L 3G1

Dr. John Cherry
(519) 888-4516

The development and production of modified steel sheet pile sections and selection of sealants for use in construction of low permeability walls has been the objective of this project. This new sheet piling differs from conventional sheet piling in that the joints can be sealed after the wall has been driven into the ground. Leakage from contained soil has been shown to be reduced to such a low value that these sheet pile cutoff walls appear suitable for a wide variety of environmental control purposes, including as a relatively low cost containment system in "pump and treat" remediation programs at contaminated sites.

1991 (3) $152 000 . (ET143WS)

Demonstration and Full-Scale Testing of a New Thermal Chemical Reduction Process for Remediation of Hamilton Harbour Sediments

ELI EcoLogic International Inc.
143 Dennis St.
Rockwood, Ont.
N0B 2K0

Dr. Douglas Hallet
(519) 856-9591

This developmental work involved an examination at the laboratory- and pilot-scale of the effectiveness of a new thermo-chemical reduction process for the destruction of such contaminants as polyaromatic hydrocarbons, polychlorinated biphenyls and other organic compounds in harbour sediments. The technology has also been assessed at the bench scale for the destruction of such pure compounds as polychlorinated biphenyls and tri- and hexachlorobenxzene. Based on such criteria as destruction efficiency, non-formation of dioxins and furans, suitability for aqueous wastes, mobility and cost, this process appears suitable for application in a wide range of organic hazardous waste problems. (See also project ET244WM).

1991 (1) $311 800 (ET153WS)
Environment Canada

Pervaporation of Volatile Organic Compounds from Contaminated Groundwater

Zenon Environmental Inc.
845 Harrington Court
Burlington, Ont.
L7N 3P3

Mr. Philip Canning
(905) 639-6320

Volatile organic compounds are widespread contaminants in wastewater, leachate and contaminated groundwater. Pervaporation is a membrane-based treatment process which separates organics and water. It is used in place of conventional treatment technologies such as air stripping and/or carbon adsorption to produce a treated effluent which is suitable for discharge to a sewer or receiving stream. The technology also can be used as part of a recycle system to reuse water or recover solvents. The primary objectives of this project are to develop an improved membrane and module design to make pervaporation a more cost-effective method of removing organic compounds from contaminated water, and to compare the improved pervaporation module and membrane design to conventional remediation technologies as well as other pervaporation module and membrane designs for the removal of organics from contaminated water.

1993 (2) $240 000 (ET201WS)
Environment Canada

Chlorine - Free Bleaching of Kraft Pulp

Domtar Inc.
Research Centre
Senneville, Qué.
H9X 3L7

Dr. Paul Earl
(514) 457-8211

The project consisted of the laboratory scale evaluation of a novel, low-capital, chlorine-free sequence for the bleaching of kraft pulp. Included in the study were preliminary engineering studies to evaluate capital and operating costs, along with the possibility of implementing the new sequence using existing bleach plant equipment. The elimination of chlorine containing chemicals would result in the virtual elimination of adsorbable organic halogens, and chlorinated dioxins and furans from the bleaching process.

1992 (1) $50 000 (ET207WS)
Environment Canada

Testing of a Nitrogen Removal System for Wastewater

Aquarobic Ltd.
12 Laurier Rd.
P.O. Box 704
Penetanguishene, Ont.
L0K 1P0

Mr. Daniel Pavon
(705) 549-7401

Aquarobic Ltd. presently manufactures a sequential batch reactor wastewater treatment plant. In this project, the company is completing a process through which the National Sanitation Foundation has tested an add-on system to the companys Class 6 sewage treatment system that will remove nitrate to an acceptable level without disrupting BOD levels. The process is based on the microbiological oxidation of ammonia nitrogen and organic nitrogen to nitrate nitrogen and its subsequent conversion to gaseous nitrogen. The objective is to use the results of the testing to obtain provincial and state approvals of the system prior to marketing.

1992 (2) $175 000 (ET220AWS)
Innovation Ontario Corporation

Development of an Integrated Computer Control System (IC^2S) for Wastewater Treatment Plant Operation.

Hydromantis Inc.
Suite 302, 1685 Main St. W.
Hamilton, Ont.
L8S 1G5

Dr. Gilles Patry
(905) 522-0012

Hydromantis has previously developed a state-of-the-art computer program for dynamic modelling and simulation of large-scale wastewater treatment plants. Referred to as the General Purpose Simulator (GPS), the program makes use of the latest developments in mathematical modelling and computer simulation and is designed to assist engineers in the planning, design and operation of wastewater treatment plants. This project will build upon the GPS leading to the development of new tools and technologies and their integration in a comprehensive package for the real-time operation of wastewater treatment plants. This capacity for real time control of mnicipal and industrial wastewater treatment plants will result in improved effluent quality under normal as well as adverse (spills, heavy loadings) operating conditions.

1993 (2) $677 100 (ET255WS)
Wastewater Technology Centre

Full Scale Demonstration of a Novel Wastewater Treatment System for Automotive Manufacturing

Zenon Environmental Inc.
845 Harrington Ct.
Burlington, Ont.
L7N 3P3

Mr. Larry Novachis
(905) 639-6320

The objective of this project is to design, build, demonstrate and evaluate the full scale operation of a new wastewater treatment technology at an operational automotive manufacturing plant. The ZenoGem™ technology employed in this project represents advanced environmental technology for oily wastewater treatment. The ZenoGem™ process has a novel configuration of membranes with biological treatment that results in greatly enhanced removal of contaminants at low operating costs and in a relatively small space compared to conventional technologies.

1993 (2) $650 000 (ET305WS)
Environment Canada
Industry Canada
General Motors of Canada

Development and Pilot-Scale Testing of *In Situ* Apparatus to Detoxify and Enhance Natural Biodegradation of Contaminated River and Lake Sediments

Limnofix Inc.
Suite 213, 2550 Argentia Rd.
Mississauga, Ont.
L5N 5R1

Mr. Jay Babin
(519) 888-0141

The goal of this project is to develop apparatus and protocols for the *in situ* treatment and remediation of contaminated sediments, an approach which holds promise as a superior and cost-effective alternative to traditional removal (dredging) and treatment technologies. The study utilizes the addition of oxidizing agents to eliminate acute toxicity (through chemical binding/oxidation of H_2S) and to promote sediment biological activity which will enhance sediment microbial degradation of organic compounds such as polyaromatic hydrocarbons and oil. Particular focus is on bench- and pilot-scale tests utilizing ferric chloride and calcium nitrate with several different contaminated test sites considered.

1993 (2) $116 000 (ET306WS)
Environment Canada
National Water Research Institute

Development of Differential Optical Absorption Spectroscopy System (DOAS) for Air Monitoring and Measurement

Unisearch Associates Inc.
222 Snidercroft Rd.
Concord, Ont.
L4K 1B5

Dr. Gervase Mackay
(905) 669-3547

The objective of this project is the development of a commercial, mobile instrument based on differential optical absorption spectroscopy capable of measuring air pollutants automatically, simultaneously and continuously with high sensitivity and selectivity. The instrument could be used either in a remote sensing mode suitable for plume or air quality measurements or *in situ* for such applications as analyzing HCL and CH_4 from stack emissions and landfills. It would also have application in field studies including that of oxidant chemistry to measure key atmospheric species, including a number such as NO_3 which cannot be measured by any other method.

1991 (3) $396 000 (ET136AP)

Development of a Range of Waterloo Scrubber Products for Flue Gas Desulphurization Markets

Turbotak Technologies Inc.
Suite A-14, 550 Parkside Dr.
Waterloo, Ont.
N2L 5V4

Dr. Donald Spink
(519) 885-5513

This project involves the development of a technology to remove sulphur dioxide from the effluent gas stream of power utilities and industrial facilities. Currently available flue gas desulphurisation processes capture sulphur dioxide by reacting it with lime or limestone to form gypsum which is then disposed of in landfills. The new process uses an aqueous solution of an organic amine to remove the sulphur dioxide gas forming a bound complex. This can subsequently be treated with steam to regenerate the free amine for reuse, and release the sulphur dioxide in a pure concentrated form for conversion into sulphuric acid or use as elemental sulphur.

1992 (2) $700 500 (ET205AAP)
Ontario Ministry of Economic Development and Trade

Monitor Ozone/Ultra Violet Network (MOUVNET) and BW3200 Meter System Design Project

Vital Technologies
3A-680 Hardwick Rd.
Bolton, Ont.
L7E 5R4

Mr. David Sweetnam
(905) 951-1219

The company is implementing a sensing network and analysis system in the province to monitor the amount of ultraviolet radiation reaching the surface of the earth. The monitoring network utilizes the company's Bluewave sensor technology which is technically superior, easier to use and available at substantially lower cost than alternatives. The demonstration network will establish the capabilities and advantages of the sensor technology as a basis for its marketing internationally.

1992 (1) $90 000 (ET274AP)

Apollo Biogas Upgrade

Apollo Environmental Systems Corporation
14, 729 Yonge St.
Aurora, Ont.
L4G 1N1

Mr. John Harbinson
(905) 727-0376

The objective of this project is to design, manufacture and install a reactor which will scrub malodorous and corrosive hydrogen sulphide, and particulate matter, from a slip-stream of biogas produced by a series of state of the art anaerobic digesters at the Ashbridges Bay Sewage Treatment Plant in Toronto. The program should demonstrate the high performance characteristics of the technology, and its ease of management and cost-effectiveness. Potentially, the technology also has application for hydrogen sulphide control in other industries, such as petroleum production and refining, pulp and paper mills and rendering plants.

1992 (1) $57 000 (ET288AP)

Development of a Nitrogen-Specific GC/ Detector for Measurement of Atmospheric Nitrates

Unisearch Associates Inc.
222 Snidercroft Rd.
Concord, Ont.
L4K 1B5

Dr. John Drummond
(905) 669-3547

This project involves the development, construction, testing and evaluation of a market-ready nitrogen specific gas chromatograph/detector designed for the sensitive and selective measurement of organic nitrates and mutagenic nitropolyaromatic hydrocarbons. Applications for the instrument would include the measurement of a variety of atmospheric pollutants that are linked to oxidant formation in the atmosphere, the analysis of nitrosamines in food and the detection of explosives.

1991 (3) $248 980 (ET066AN)
National Research Council

Development of Supercritical Fluid Extraction (SFE) with Ion Mobility Detector (IMD) for Qualitative Prescreening for Environmental Contaminants

Pylon Electronic Development Co. Ltd.
147 Colonnade Rd.
Nepean, Ont.
K2E 7L9

Dr. Frank Bales
(613) 226-7920

The integration, development and testing of the technologies of Ion Mobility Detection and Supercritical Fluid Extraction to construct a self-contained, field portable and cost effective extraction instrument is the focus of this study. This tool could be used to extract, concentrate and qualitatively analyze numerous organic contaminants occurring in most environmentally sensitive effluents and other matrices.

1991 (1) $89 450 (ET094AN)

On-Line Microwave Digestion for Environmental Samples

Questron Canada Inc.
5312 Turney Dr.
Mississauga, Ont.
L5M 4Y7

Mr. Paul Burgener
(905) 542-0784

Frequently, the sample digestion step is the major constraint to the rapid analysis of environmental samples. Traditional sample digestion methodologies are either labour intensive or very time consuming, and often are both. More recently, microwave digestion of samples has become popular. Unfortunately, the most effective microwave procedures involve the use of bombs which require extensive labour and involve some degree of hazard, problems which have been proven unable to be overcome with robotic handling systems. This project will commercialize a microwave system previously developed at McGill University which involves the use of tubing and valves rather than bombs. This allows the system to be loaded and cleaned rapidly and efficiently without the use of manual labour, leading to increased speed and reduced costs of sample analysis, while generating less waste and increasing safety.

1992 (3) $374 000 (ET265AN)

Ontario

Technologies featured on front cover, clockwise from left.

- Mikro-Tek Laboratories' use of metal and water tolerant alders to control acid mine drainage
- Halozone Recycling's Blue Bottle™ Cylinders for reclaiming CFCs from air conditioners and refrigerators
- ShredTech's transportable tire shredder
- Battery Technologies' mercury-free reusable alkaline manganese dioxide (RAM) consumer batteries

Technologies featured on back cover:

Top: Jasmetech Metal Technologies's pilot plant for capturing cyanide and metals from gold mill effluent
Bottom: Zenon Environmental's wastewater treatment unit

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